REMARKS/ARGUMENTS:

Claims 3-5, and 8 amended. Claims 1 and 2 are canceled without prejudice. Claims 3-8 and 11-25 are pending in the application. Reexamination and reconsideration of the application, as amended, are respectfully requested.

CLAIM REJECTIONS UNDER 35 U.S.C. § 102:

Claims 1-4, 7-14, 17-24 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Akahori et al., U.S. Patent No. 5,081,229.

Claim 25 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Akahori in view of Tanaka (JP 2000-297163).

These rejections are moot with respect to claims 1 and 2 due to the cancellation of claims 1 and 2. Applicant respectfully traverses these rejections as to claims 3, 4, 7, 8, 11-14, and 17-25.

Claims 3, 4, 7, and 8 depend from amended claim 5. Claim 5 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Akahori in view of Tanaka (JP 2000-297163).

A feature of claim 5 is as follows:

A laminate comprising a metal layer and a polyimide film, the metal layer being directly formed on the polyimide film prepared by copolymerizing an acid dianhydride component and a diamine component,

the acid dianhydride component including a pyromellitic dianhydride represented by Equation (1),

the diamine component including a paraphenylene diamine represented by Equation (2) and a diaminodiphenyl ether represented by Equation (3),

the acid dianhydride component further including a bis(trimellitic monoester anhydride) represented by Equation (4) and/or a biphenyl tetracarboxylic dianhydride represented by Equation (5),

the polyimide film having a dynamic viscoelasticity whose tan δ peak is located in a range of not less than 310°C but not more than 410°C, and whose tan δ value at 300°C is not more than 0.05.

It is an aspect of the present invention, that the Applicants obtained (i) a polyimide film having a low thermal shrinkage rate at a high temperature (300°C) and (ii) a laminate using the polyimide film. As a result of this work, the Applicants discovered a remarkable fact that there is correlation between the temperature range of the tan δ peak and the tan δ value at 300°C, thereby completing the invention according to claim 5. In order to obtain the polyimide film having a low thermal shrinkage rate at a high temperature, it is necessary to focus not only on the monomer composition constituting polyimide but also on variation in the dynamic viscoelasticity of the polyimide film. That is, the invention according to claim 5 is characterized in the monomer composition and the dynamic viscoelasticity of the polyimide film.

In contrast, Akahori states that: by modifying a polyimide polymerization method, it is possible to obtain a polyimide film which is excellent in the thermal size stability and the mechanical property, so that the polyimide film is free from any warp or any curl upon being laminated on a metal foil. More specifically, Akahori recites the following arrangement: aromatic dianhydride and diamine including ODA and P-PDA are used, and either aromatic dianhydride or diamine is excessively used so as to produce a polyamic prepolymer having an acid dianhydride end and a diamine end, and then the polyamic prepolymer is used as part of the diamine component or the acid dianhydride component, thereby producing a polyimide film having a desired property. Thus, the invention taught by Akahori is characterized in which kind of diamine is used to produce polyimide and in a polyimide polymerization method.

Akahori is totally silent about one of the features of the invention according to claim 5, i.e., a design concept that of a polyimide film wherein the polyimide film has a dynamic viscoelasticity whose tan δ peak is located in a range of not less than 310°C but not more than 410°C and whose tan δ value at 300°C is not more than 0.05, so as to decrease the thermal shrinkage rate at a high temperature. Further, the designing concept of the polyimide film was discovered by the Applicants of the present invention, so that the idea of the invention according to claim 5 should not be regarded as being anticipated or obvious. Thus, the Applicants respectfully submit that the invention according to claim 5 is neither anticipated or rendered obvious by Akahori.

Further, in the Declaration filed August 2, 2005, the Applicants added Examples of Akahori so as to verify that the polyimide film disclosed by Akahori does not satisfy any parameter of the dynamic viscoelasticity of the polyimide film defined in claim 5 of the present invention. However, the Office states that: these Examples are obtained in the case where a specific polyimide precursor is used, so that these Examples do not fall within the scope of claim 5. The Examples added in the Declaration are: Akahori's Examples obtained by changing a ratio of essential ODA and P-PDA; and Akahori's Examples obtained by changing a ratio of diamine and acid dianhydride in producing the prepolymer (Akahori's Examples 1, 2, 4, 6, 9, and 12). As explained above, the invention of Akahori is characterized in (i) the arrangement in which ODA and P-PDA are essentially used and (ii) the polyimide polymerization method. Thus, the Applicants believe that a polyimide film produced by changing conditions based on these characteristics sufficiently covers the scope of claim in Akahori. Thus, the fact that the polyimide film produced in each of the Examples does not satisfy any parameter of the dynamic viscoelasticity defined in claim 5 of the present invention makes it clearer that the invention of Akahori and the invention according to claim 5 of the present invention are

different from each other. Further, as to the recitation of Akahori, if it is necessary to excessively carry out tests in order to obtain a polyimide film which satisfies the parameter of the dynamic viscoelasticity defined in claim 5 of the present invention, the invention according to claim 5 of the present invention is neither anticipated or rendered obvious by Akahori.

While, Tanaka recites a polyimide film made of four components: p-phenylene bis(trimellitic monoester anhydride), oxydiphthalic dianhydride, p-phenylenediamine, and 4,4'-diaminodiphenylether; an object of Tanaka is to produce a polyimide film having properties (high elasticity, high storage elasticity, low coefficient of linear expansion, and low coefficient of hygroscopic expansion) required in case of using the polyimide film in a flexible print wiring board. Thus, the object of Tanaka is completely different from the invention according to claim 5 whose object is to produce a polyimide film having a low thermal shrinkage rate at a high temperature. Thus, there is no motivation for combining Tanaka with Akahori in realizing the object to produce a polyimide film having a low thermal shrinkage rate at a high temperature. Further, neither Akahori nor Tanaka teach or suggest a combination thereof.

Thus, the Applicants respectfully submit that the invention according to claim 5 is neither anticipated or rendered obvious by Akahori and Tanaka. Further, the claims dependent on claim 5 can neither be anticipated or rendered obvious over Akahori and Tanaka for at least the reasons discussed above.

A feature of claim 11 is as follows:

A polyimide film prepared by copolymerizing an acid dianhydride component and a diamine component,

the acid dianhydride component including a pyromellitic dianhydride being represented by General Formula (1) and a biphenyl tetracarboxylic dianhydride being represented by General Formula (5),

the polyimide film having such an etching speed that one side thereof is etched with a 1N potassium hydroxide solution at an etching speed of 0.1 μm/minute (one side) or higher.

In contrast, Akahori recites a polyimide film prepared by copolymerizing a biphenyl tetracarboxylic acid and a pyromellitic dianhydride. Akahori is totally silent about a polyimide film etched at an alkali etching speed of 0.1 μm / minute (one side) or higher. An object of Akahori is to obtain a polyimide film excellent in the thermal size stability or polyimide which is free from any warp or any curl upon being laminated on a metal foil, so that Akahori is totally silent about the alkali etching property.

In the Declaration (filed on August 2, 2005), the Applicants verified that the polyimide film disclosed by Akahori does not satisfy the alkali etching property defined in claim 11. As discussed above, the polyimide film produced by the Applicants in each Additional Example sufficiently covers the scope of claim of Akahori. Thus, it is apparent that the polyimide film according to claim 11 of the present invention is neither anticipated or rendered obvious over Akahori.

Further, the polyimide film according to claim 11 of the present invention is such that: unlike a conventional polyimide film whose stability drops under harsh environments upon improving the alkali etching property, a film itself has long-term stability under harsh environments even though the alkali etching speed is high. The Applicants are unaware of any conventional technique that realizes the polyimide film having such an alkali etching speed that one side thereof is etched with alkali etchant whose alkali concentration is low (e.g., 1N sodium hydroxide solution) at a higher etching speed. The Applicants found it possible to realize an excellent alkali etching property by preparing a polyimide film including a bis(trimellitic monoester anhydride) as its copolymerization component for example. Further, the Applicants found that a film having an excellent alkali etching

property does not have long-term stability under harsh conditions (high temperature and high humidity). That is, both the alkali etching and the degradation under high temperature and high humidity are caused by the hydrolysis, so that it is extremely difficult to realize both the improvement of the alkali etching property and the higher long-term stability under the harsh conditions (high temperature and high humidity). Thus, a film having these contrasting properties has not been found. That is, a polyimide film having (i) a higher etching speed in being etched with an alkali etchant whose alkali concentration is low and (ii) excellent environment-resistant stability has not been found. It is an aspect of the present invention that the Applicants obtained a polyimide film having an excellent alkali etching property. It is a discovery of the present invention that the Applicants found it possible to improve the environment-resistant stability by polymerizing a biphenyl tetracarboxylic dianhydride as a polyimide polymerization component. Further, the Applicants uniquely found it possible to realize both the higher environment-resistant stability and the more excellent alkali etching property, for example, by polymerizing a biphenyl tetracarboxylic dianhydride with a pyromellitic dianhydride and copolymerizing a bis(trimellitic monoester anhydride). As a result of these discoveries, the Applicants succeeded in obtaining a polyimide film having both the higher alkali etching speed and the excellent environment-resistant stability. These findings are neither taught nor suggested in Akahori. Thus, the invention according to claim 11 is neither anticipated or rendered obvious by Akahori.

While Tanaka recites a polyimide film constituted of four components: p-phenylene bis(trimellitic monoester anhydride), oxydiphthalic dianhydride, p-phenylenediamine, and 4,4'-diaminodiphenylether, Tanaka is totally silent about an object of claim 11 which is to improve the alkali etching property of the polyimide film. Thus, there is no motivation for combining Tanaka with Akahori in

improving the alkali etching property of the polyimide film. Further, neither Akahori nor Tanaka teach or suggest a combination thereof.

Thus, the polyimide film according to claim 11 and claims dependent therefrom and the laminate according to claim 18 which is produced by using a polyimide film arranged in the same manner as in claim 11 are neither anticipated or rendered obvious over Akahori and Tanaka.

A feature of claim 19 is as follows:

A polyimide film prepared by copolymerizing an acid dianhydride component and a diamine component,

the acid dianhydride component including the pyromellitic dianhydride, represented by General Formula (1), in a range of from 40 mole% to 80 mole%, the biphenyl tetracarboxylic dianhydride, represented by General Formula (5) in a range of from 1 mole% to 40 mole%, and the bis(trimellitic monoester anhydride, represented by General Formula (4), in a range of from 20 mole% to 50 mole%,

the diamine component including the paraphenylene diamine, represented by General Formula (2), in a range of 25 mole% to 75 mole%, and the diamine diphenyl ether, represented by General Formula (3), in a range of 25 mole% to 75 mole%.

In contrast, Akahori recites an arrangement in which a polyimide film is produced by using (i) a diamine component including a diamino diphenyl ether and a paraphenylene diamine as essential components and (ii) an acid dianhydride component including a pyromellitic dianhydride and a biphenyl tetracarboxylic dianhydride. However, Akahori is totally silent about an arrangement in which a paraphenylene bis(trimellitic anhydride) is used. Further, Akahori is totally silent about an arrangement in which a polyimide film is produced by using the foregoing five components (the diamine diphenyl ether, the paraphenylene diamine, the pyromellitic dianhydride, the biphenyl tetracarboxylic dianhydride, and the

paraphenylene bis(trimellitic anhydride)) used in producing the polyimide film according to claim 19 of the present invention at a specific rate.

Tanaka recites a polyimide film constituted of four components: p-phenylene bis(trimellitic monoester anhydride), oxydiphthalic dianhydride, p-phenylenediamine, and 4 ,4'-diaminodiphenylether. Tanaka is totally silent about an arrangement in which a polyimide film is produced by using the foregoing five components (the diamine diphenyl ether, the paraphenylene diamine, the pyromellitic dianhydride, the biphenyl tetracarboxylic dianhydride, and the paraphenylene bis(trimellitic anhydride)) used in producing the polyimide film according to claim 19 of the present invention at a specific rate. Further, in paragraph [0050] of Tanaka states: *A slight amount of a diamine monomer component other than the four monomers is added, that is, 10 mol% or less of whole the diamine or 15 mol% or less of whole the acid dianhydride is added, thereby minutely adjusting a property of the obtained polyimide film. This condition depends on which kind of monomer is used, but it is possible to keep the favorable moisture absorption property, the favorable thermal property, and the favorable mechanical property, as long as the copolymerization is carried out with an amount equal to or less than the foregoing amount. As the slight amount of monomer, ... , examples of the acid anhydride include 3,3', 4,4'-biphenyl tetracarboxylic dianhydride, 3,3', 4,4'-benzophenone tetracarboxylic dianhydride, a pyromellitic dianhydride, 3,3', 4,4'-diphenyl sulfone tetracarboxylic dianhydride, and the like.* This recitation suggests that it is not so preferable to use a large amount of other monomer component such as the pyromellitic dianhydride. Thus, the invention according to claim 19 contradicts the Tanaka invention in terms of the technical concept; and Tanaka teaches away from the present invention. Applicants respectfully submit that a person with ordinary skill in the art who refers to Tanaka would not produce a polyimide film at least by using 40 to 80 mol% of

pyromellitic dianhydride in the same manner as in the polyimide film according to claim 19 of the present invention.

Further, neither Akahori nor Tanaka has such recitation that: it is possible to obtain a polyimide film extremely excellent not only in the initial peel strength but also in the peel strength retention after the harsh environmental resistance test by using a monomer constituted of the five components (the diamine diphenyl ether, the paraphenylene diamine, the pyromellitic dianhydride, the biphenyl tetracarboxylic dianhydride, and the paraphenylene bis(trimellitic anhydride)) at a specific rate. Thus, the there is no motivation for combining Tanaka with Akahori in obtaining the polyimide film extremely excellent not only in the initial peel strength but also in the peel strength retention after the harsh environmental resistance test. Further, neither Akahori nor Tanaka teach or suggest a combination thereof.

Thus, the polyimide film according to claim 19 and claims dependent therefrom and the laminate according to claim 25 which is produced by using a polyimide film arranged in the same manner as in claim 19 are neither anticipated by or rendered obvious over Akahori and Tanaka.

In light of the foregoing, Applicant respectfully submits that Akahori and Tanaka could not have rendered claims 3, 4, 7, 8, 11-14, and 17-25 obvious, because the combination of references fails to teach or suggest each and every claim limitation. Reconsideration and withdrawal of the above rejection is thus respectfully requested.

CLAIM REJECTIONS UNDER 35 U.S.C. § 103:

Claims 5-7, 15, 16, and 25 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Akahori as applied to claims 1-4, 7-14, 17-24 above, and further in view of Tanaka (JP 2000-297163). Applicant respectfully traverses this rejection.

Claims 5-7, 15, 16, and 25 are patentable over Akahori and Tanaka for the reasons discussed above. Reconsideration and withdrawal of the above rejection is thus respectfully requested.

Applicant believes the foregoing amendments comply with requirements of form and thus may be admitted under 37 C.F.R. § 1.116(b). Alternatively, if these amendments are deemed to touch the merits, admission is requested under 37 C.F.R. § 1.116(c). In this connection, these amendments were not earlier presented because they are in response to the matters pointed out for the first time in the Final Office Action.

Lastly, admission is requested under 37 C.F.R. § 1.116(b) as presenting rejected claims in better form for consideration on appeal.

In view of the foregoing, it is respectfully submitted that the application is in condition for allowance. Reexamination and reconsideration of the application, as amended, are requested.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the undersigned attorney at the Los Angeles, California telephone number (213) 337-6700 to discuss the steps necessary for placing the application in condition for allowance.

If there are any fees due in connection with the filing of this response, please charge the fees to our Deposit Account No. 50-1314.

Respectfully submitted,
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Date: February 21, 2006

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